mask **17**. This is illustrated in FIG. **24**. The doping profile of the second semiconductor zones can thereby be laterally and/or horizontally modified. By way of example, it is thus possible to produce subregions **2***a* having an increased dopant concentration in the second semiconductor regions **2**, as is illustrated in FIG. **25**. Afterward, a further thermal treatment step can be effected, and the anode and cathode metallizations can be formed, as previously explained with reference to FIG. **23**. The resultant semiconductor structure **100** is illustrated schematically in FIG. **26**. It is similar to the semiconductor structure **100** shown in FIG. **3** and can likewise be operated as a diode.

FIGS. **27** to **31** illustrate processes of a production method in accordance with one embodiment. FIG. **27** shows a semiconductor substrate **20** having a weakly n-doped first semiconductor zone **1** extending as far as a first surface **15**. Typically, the semiconductor substrate **20** again contains an n-doped contact region **4**, which extends as far as a second opposite surface **16** and has a higher maximum dopant concentration than the first semiconductor zone **1**. As shown in FIG. **27**, donor ions, e.g. phosphorus, antimony or arsenic ions, are then implanted in whole-area fashion through the first surface **15**. This leads to the formation of a continuous, very highly doped layer **3***c* extending from the first surface **15** into the semiconductor substrate **20**. A photopatterned mask **17** is then produced on the first surface **15**, which is illustrated in FIG. **28**. By means of an anisotropic etching step through the mask **17**, the layer **3***c* is divided into zones **3***c* spaced apart from one another. Afterward, the mask **17** is removed and acceptor ions, e.g. boron (B) ions, are implanted in whole-area fashion from the first surface **15**. This is illustrated in FIG. **29**. The implantation step with acceptor ions gives rise, as illustrated in FIG. **30**, to very heavily p-doped zones **2***c* spaced apart from one another vertically below and laterally between the spaced-apart zones **3***c*. High-temperature steps for distributing and incorporating the dopants in the depth and in the semiconductor substrate **20** can then be carried out, and the anode and cathode metallizations can be formed, as has already been explained with reference to FIG. **23**. The resultant semiconductor structure **100** is illustrated schematically in FIG. **31**. It is similar to the semiconductor structures **100** shown in FIGS. **1** and **23** and can likewise be operated as a diode **100**. Optionally, as explained with reference to FIGS. **24** and **25**, the doping profile of the second semiconductor zones **2** can be set by means of an additional masked implantation step.

Further processes of a production method are explained next with reference to FIG. **32**. FIG. **32** shows a bipolar semiconductor component **100** having an n-doped first semiconductor zone **1** extending as far as a first surface **15** of the semiconductor substrate **20**. The semiconductor component **100** further has an n-doped contact region **4**, which extends as far as a second opposite surface **16** of the semiconductor substrate **20** and has a higher maximum dopant concentration than the first semiconductor zone **1**. Moreover, the semiconductor substrate **20** contains an n-doped buffer region **6**, which is arranged between the first semiconductor zone **1** and the contact region **4** and has a maximum dopant concentration that is higher than the maximum dopant concentration of the first semiconductor zone **1** and lower than the maximum dopant concentration of the contact region **4**. Furthermore, the semiconductor substrate **20** contains a plurality of mutually spaced apart p-doped island zones **5** arranged between the contact region **4** and the buffer region **6**. Such a structure can be produced by means of suitable epitaxy steps and/or implantation steps. Afterward, a plurality of p-doped anode emitter zones **2** spaced apart from one another are produced from the first surface **15** and an anode metallization **8** is formed on the first surface **15** in electrical contact with the anode emitter zones **2**, and a cathode metallization **9** is formed on the second surface **16**.

In one embodiment, the anode emitter zones **2** are produced in such a way that they form with the first semiconductor zone **1** pn junctions **11** spaced apart from one another, which leads to a semiconductor component **100** as shown in FIG. **9**.

In an alternative embodiment, a continuous p-doped emitter zone **7** is additionally produced in the first semiconductor zone **1** from the first surface **15**, which emitter zone extends as far as the first surface **15** and has a maximum dopant concentration that is lower than the maximum dopant concentration of the anode emitter zones **2**, and into which emitter zone the anode emitter zones **2** are embedded. This leads to a semiconductor component **100** as shown in FIG. **10**.

Spatially relative terms such as “under”, “below”, “lower”, “over”, “upper” and the like, are used for ease of description to explain the positioning of one element relative to a second element. These terms are intended to encompass different orientations of the device in addition to different orientations than those depicted in the figures. Further, terms such as “first”, “second”, and the like, are also used to describe various elements, regions, sections, etc. and are also not intended to be limiting. Like terms refer to like elements throughout the description.

As used herein, the terms “having”, “containing”, “including”, “comprising” and the like are open ended terms that indicate the presence of stated elements or features, but do not preclude additional elements or features. The articles “a”, “an” and “the” are intended to include the plural as well as the singular, unless the context clearly indicates otherwise.

With the above range of variations and applications in mind, it should be understood that the present invention is not limited by the foregoing description, nor is it limited by the accompanying drawings. Instead, the present invention is limited only by the following claims and their legal equivalents.

What is claimed is:

1. A bipolar semiconductor component, comprising:

a semiconductor body having a first horizontal surface, a second surface which runs substantially parallel to the first surface, and at least one load pn junction;

a first metallization arranged on the first surface;

a second metallization arranged on the second surface;

at least one current path which runs in the semiconductor body from the first metallization to the second metallization only through n-doped zones; and

wherein a space charge region forms in the semiconductor body beginning below the at least one load pn junction and extending above the at least one load pn junction and ending before the first horizontal surface to prevent current flow between the first and second metallizations when a positive voltage is applied between the second metallization and the first metallization.

2. The bipolar semiconductor component as claimed in claim **1**, wherein, in the semiconductor body, an n-doped first semiconductor region is arranged in ohmic contact with the second metallization; wherein a plurality of p-doped second semiconductor regions spaced apart from one another horizontally in the semiconductor body are arranged in a sectional plane perpendicular to the first surface, the second semiconductor regions being in ohmic contact with the first metallization and respectively forming a load pn junction with the first semiconductor region in the perpendicular sectional plane; and wherein an n-doped channel zone is arranged